

Unit 16

Day 4

Properties of Logarithms

PROPERTIES OF LOGARITHMS

If x and y are any positive real numbers, r is any real number, and a is any positive real number, $a \neq 1$, then the following properties are true.

a) $\log_a xy = \log_a x + \log_a y$

b) $\log_a \frac{x}{y} = \log_a x - \log_a y$

c) $\log_a x^r = r \log_a x$

d) $\log_a a = 1$

e) $\log_a 1 = 0$

Write each expression as a sum, difference, or product of logarithms. Simplify if possible. Assume that all variables represent positive real numbers.

1)

$$\log_2 4p^3$$

$$\log_2 4 + \log_2 p^3$$

$$\log_2 4 + 3 \log_2 p$$

$$2 + 3 \log_2 p$$

2)

$$\log_4 \frac{3m}{m+2}$$

$$\log_4 3m - \log_4 (m+2)$$

$$\log_4 3 + \log_4 m - \log_4 (m+2)$$

Write each expression as a sum, difference, or product of logarithms. Simplify if possible. Assume that all variables represent positive real numbers.

3) $\log_5 \frac{7m^3}{8y}$

$$\log_5 7m^3 - \log_5 8y$$

$$\log_5 7 + \log_5 m^3 - (\log_5 8 + \log_5 y)$$

$$\log_5 7 + 3\log_5 m - \log_5 8 - \log_5 y$$

4) $\log_4 \sqrt[3]{\frac{m^2 n^5}{p}}$

$$\log_4 \left(\frac{m^2 n^5}{p} \right)^{1/3}$$

$$\frac{1}{3} \log_4 \frac{m^2 n^5}{p}$$

$$\frac{1}{3} (\log_4 m^2 n^5 - \log_4 p)$$

$$\frac{1}{3} \log_4 m^2 + \frac{1}{3} \log_4 n^5 - \frac{1}{3} \log_4 p$$

$$\frac{2}{3} \log_4 m + \frac{5}{3} \log_4 n - \frac{1}{3} \log_4 p$$

Write each expression as a single logarithm with a coefficient of 1. Assume that all variables represent positive numbers.

5)

$$\log_2 5m + \log_2 3k$$

$$\log_2 15mk$$

6)

$$\log_4 8y + \log_4 3y - \log_4 6y^3$$

$$\log_4 24y^2 - \log_4 6y^3$$

$$\log_4 \frac{24y^2}{6y^3}$$

$$\log_4 \frac{4}{y}$$

7)

$$\log_2(x-1) + \log_2(x+1) - \log_2(x^2-1)$$

$$\log_2(x^2-1) - \log_2(x^2-1)$$

$$\log_2 \frac{x^2-1}{x^2-1}$$

$$\log_2 1$$

$$0$$

HOMEWORK

Unit 16

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p. 383: 57-70 (all)